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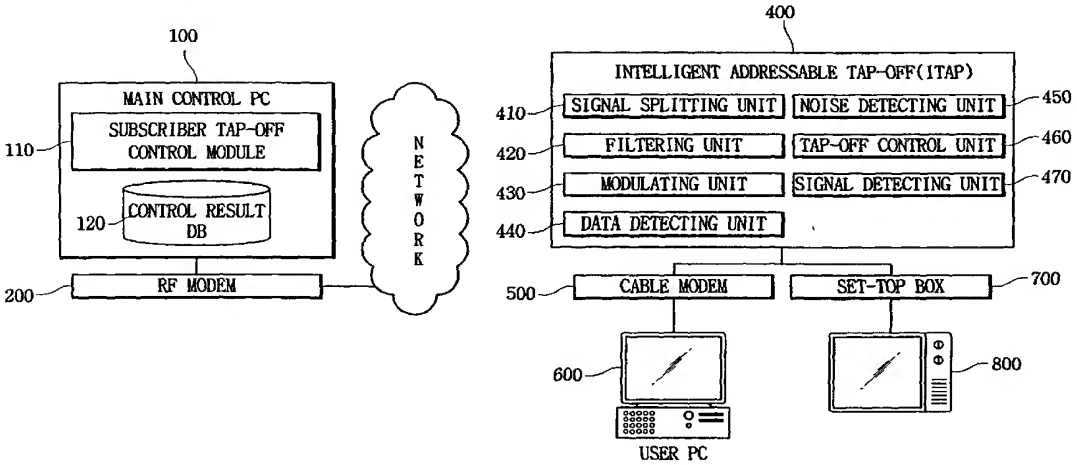
(54) **Title:** SUBSCRIBER TAP-OFF CAPABLE OF MONITORING STATE OF TRANSMISSION LINE AT SUBSCRIBER END, AND REMOTE CONTROL SYSTEM AND METHOD USING THE SAME



(57) **Abstract:** Disclosed are a subscriber tap-off capable of monitoring respective states of transmission lines at subscriber ends, and a remote control system and method using the subscriber tap-off. The remote control is carried out by controlling the subscriber tap-off to sense line break or short circuit generated at a communication line connected to a user terminal, and noise generated at the communication line, and controlling a main control terminal to generate a signal for controlling the subscriber tap-off, thereby controlling a tap port ON/OFF operation of the subscriber tap-off, whereby the communication line is monitored.

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SUBSCRIBER TAP-OFF CAPABLE OF MONITORING STATE OF TRANSMISSION LINE AT SUBSCRIBER END, AND REMOTE CONTROL SYSTEM AND METHOD USING THE SAME

Technical Field

The present invention relates to data communications, and more particularly to a subscriber tap-off capable of sensing problems such as line break, short circuit, and noise generated at a transmission line connected to a subscriber terminal associated with, for example, Internet or cable TV services, and a remote control system and method capable of identifying the cause of the problem generated at the transmission line based on the sensed result by the subscriber tap-off, thereby securing an efficient data transmission.

Background Art

The Internet has been mainly used as a tool allowing users to easily acquire diverse information. Such Internet has greatly contributed to development of information technologies (ITs). Taking into consideration an increase in the number of subscribers, communication providers have given priority to the expansion of installations for accommodating the increased number of subscribers, rather than the quality management of transmission networks.

In pace with the development of internet technologies, the demand for cable TV networks and hybrid fiber coaxial cable (HFC) networks has also been increased. An HFC technology is a communication technique in which both an optical fiber cable and a coaxial cable are used at different portions of a network, respectively, in order to transport broadband contents such as video, data and audio.

However, an increased expansion of network installations may cause a problem in that it is difficult to systematically manage the operation of the communication network. In particular, the installed subscriber tap-off may have an insufficient number of subscriber ports because it is impossible to accurately estimate, at the installation stage of the subscriber tap-off, the number of subscribers in future. Furthermore, there is no failure recovery device developed for such a subscriber tap-off in spite of the fact that the

failures generated at the subscriber tap-off correspond to 70% of the total failures occurring in the network.

Disclosure of the Invention

Therefore, the present invention has been made in view of the above mentioned problems, and an object of the invention is to achieve an enhancement in communication quality meeting the demands of subscribers.

Another object of the invention is to rapidly solve problems generated in the network.

Another object of the invention is to provide a remote control system capable of controlling subscriber connection and disconnection operations in a bidirectional communication fashion, easily identifying an unauthorized user, and rapidly identifying the position of a drop line connected to a subscriber terminal where a problem such as line break, short circuit or noise occurs.

In accordance with one aspect, the present invention provides a subscriber tap-off for supplying a data communication signal to a user terminal via an associated one of tap ports, the subscriber tap-off operating in accordance with a tap port control signal from a main control terminal via a network, comprising:

a signal detecting unit for detecting whether or not line break or short circuit is generated at a drop line connected between the user terminal and the tap port, thereby monitoring the drop line; and

a tap-off controlling unit for receiving information about the detected result from the signal detecting unit, and switching on or off the tap port, based on the received information.

In accordance with another aspect, the present invention provides a remote control system for controlling a user terminal connected thereto via a network by transmitting a control signal to the user terminal in a remote fashion, comprising:

a subscriber tap-off for detecting at least one of communication line problems associated with a line break or short circuit generated at a drop line connected to the user terminal, and noise generated at the drop line, thereby switching on and off a tap port connected to the drop line; and

a main control terminal for at least one function for switching on and

off a connected state of the tap port, and transmitting a tap port ON/OFF signal to the subscriber tap-off,

whereby the drop line is monitored.

In accordance with another aspect, the present invention provides a remote control method carried out using a remote control system for controlling a user terminal connected thereto via a network by transmitting a control signal to the user terminal in a remote fashion, comprising the steps of:

controlling a subscriber tap-off included in the remote control system to sense at least one of communication line problems associated with a line break or short circuit generated at a communication line connected to the user terminal, and noise generated at the communication line; and

controlling a main control terminal included in the remote control system to generate a signal for controlling the subscriber tap-off, thereby controlling a tap port ON/OFF operation of the subscriber tap-off in accordance with at least one control function,

whereby the communication line is monitored.

Brief Description of the Drawings

The above objects, and other features and advantages of the present invention will become more apparent after a reading of the following detailed description when taken in conjunction with the drawings, in which:

Fig. 1 is a block diagram illustrating a subscriber tap-off for monitoring respective states of transmission lines connected to subscriber terminals, and a remote control system using the subscriber tap-off;

Fig. 2 is a circuit diagram illustrating a detailed configuration of the subscriber tap-off shown in Fig. 1; and

Figs. 3a and 3b are flow charts illustrating a remote control method according to an embodiment of the present invention.

Best Mode for Carrying Out the Invention

Now, preferred embodiments of the present invention will be described in detail with reference to the annexed drawings.

Fig. 1 is a block diagram illustrating a subscriber tap-off for monitoring respective states of transmission lines connected to subscriber

terminals, that is, drop lines, associated with, for example, Internet or cable TV services, and a remote control system using the subscriber tap-off.

As shown in Fig. 1, the remote control system includes a main control personal computer (PC) 100 for receiving information about a problem generation position where a problem such as line break, short circuit, or noise has been generated at a drop line, which is a data communication line, thereby automatically controlling the turning-on and –off of the tap port associated with the drop line. The remote control system also includes a radio frequency (RF) modem 200 for modulating signals transmitted from the main control PC 100 while demodulating signals received via a network 300, and an intelligent addressable tap-off (ITAP) 400 as a subscriber tap-off. The ITAP 400 senses a line break or short circuit generated at tap ports connected to respective subscriber terminals while measuring signal noise generated at drop lines connected to respective tap ports thereof. The ITAP 400 automatically switches on and off its tap ports under the control of the main control PC 100, and transfers data communication signals via a drop terminal for a cable modem 500 connected to a user PC 600 or a drop terminal for a set-top box 700 connected to a TV 800.

The main control PC 100 includes a subscriber tap-off control module 110 for storing a program adapted to check occurrence of problems in the subscriber tap-off 400, and a control result database 120 for storing information about the result of a remote control carried out by the main control PC 100, and information about subscriber terminals connected to the subscriber tap-off 400.

The subscriber tap-off control module 110 and control result database 120 may be independent application programs stored in the main control PC 100. Alternatively, they may be storage media storing application programs adapted to execute functions respectively associated therewith. Of course, the subscriber tap-off control module 110 and control result database 120 may have other configurations.

The subscriber tap-off 400 includes a signal splitting unit 410 for splitting a test signal, and a tap port ON/OFF control signal from the main control PC 100, a filtering unit 420 for selecting only a signal of a particular frequency band, and a modulating unit 430 for modulating a transmission signal for transmitting problem generation position information associated

with drop lines, at which generation of problems such as line break, short circuit or noise is sensed. The subscriber tap-off 400 also includes a data detecting unit 440 for detecting data contained in the test and control signals transmitted from the main control PC 100, a noise detecting unit 450 for automatically detecting noise signals generated at the drop lines, a tap-off controlling unit 460 for recognizing drop lines at which a problem associated with line break, short circuit or noise has been generated, receiving a tap port ON/OFF control signal, performing a tap port ON/OFF control for a tap port associated with the received tap port ON/OFF control signal, in response to the tap port ON/OFF control signal, and generating a tap-off operation control signal, and a signal detecting unit 470 for detecting problems associated with line break and short circuit and generated at each of the drop lines.

Fig. 2 is a circuit diagram illustrating a detailed configuration of the subscriber tap-off 400 shown in Fig. 1.

As shown in Fig. 2, the signal splitting unit 410 includes one or more signal splitters. Each signal splitter serves to split an operation control signal in order to distribute the operation control signal to the filtering unit 420, noise detecting unit 450, and signal detecting unit 470.

The filtering unit 420 includes one or more bandpass filters (BPF) 420. Each BPF 420 receives the distributed signal from the signal splitting unit 410, filters the received signal, and transmits the filtered signal to the data detecting unit 440. Each BPF 420 also serves to filter a modulated signal from the modulating unit 430 before the modulated signal is sent to the main control PC 100.

The modulating unit 430 performs a frequency modulation for signals from the tap-off controlling unit 460 to be sent to the main control PC 100.

The data detecting unit 440 receives a signal filtered by the filtering unit 420, and detects data from the filter signal, which is an RF signal. The data detecting unit 440 also transfers data noise detected by the noise detecting unit 450 to the tap-off controlling unit 460.

The noise detecting unit 450 detects signal noise received via the signal detecting unit 470.

The tap-off controlling unit 460 performs identification of the tap port ON/OFF state and control for tap port switching on/off operations, senses generation of line break, short circuit, and noise at drop lines, and transmits,

to the main control PC 100, data associated with the line break, short circuit, and noise generated at the drop lines.

The signal detecting unit 470 includes a voltage supply module 471 including resistors R1 and R2 for distributing a supply power, and capacitors C1 and C2 for cutting off DC components while serving to supply a power supply voltage VCC to integrated circuits (IC) 472. The ICs 472 are also included in the signal detecting unit 470. Each IC 472 serves to receive a control signal generated from a central processing unit (CPU) included in the tap-off control unit 460 in response to variations in respective voltages applied to the resistors R3 and R4, thereby switching on or off the tap port associated therewith. The signal detecting unit 470 also includes a detecting module 473 including resistors R3 and R4 for detecting line break and short circuit, and a capacitor C3 for passing a signal adapted to supply a data signal to each subscriber terminal.

In Fig. 2, the reference numeral "900" denotes a directional coupler.

Respective operations of the subscriber tap-off and the remote control system using the subscriber tap-off according to the illustrated embodiment of the present invention will now be described.

The term "drop line" used in the illustrated embodiment of the present invention represents a communication line extending from the subscriber tap-off 400 to the cable modem 500. Line break, short circuit, or signal noise may be generated in such a drop line. The subscriber tap-off 400 opens its tap port or ports by the IC performing a switching operation in accordance with a control signal received thereto.

Figs. 3a and 3b are flow charts illustrating a remote control method according to an embodiment of the present invention.

The tap-off controlling unit 460 checks, for a predetermined period of time, whether or not line break, short circuit or noise has been generated, while transmitting data received via the network to the drop terminal of the cable modem 500 of each user PC 600 (Step S100). The checking of line break and short circuit is carried out using a voltage drop method. That is, this checking is carried out by detecting a variation in voltage depending on a variation in the resistances of the resistors R3 and R4. For example, an increase in voltage occurs under the condition in which line break is generated, whereas a voltage drop occurs under the condition in which short

circuit is generated, or unauthorized communication line sharing occurs. Thus, the tap-off controlling unit 460 determines a normal state when the checked voltage corresponds to 3V, a line break state when the checked voltage corresponds to 5V, and a short circuit state when the checked voltage corresponds to 0V. Generation of noise is also checked. This checking is carried out by the noise detecting unit 450. That is, the noise detecting unit 450 checks, for each drop line, whether or not noise is generated at the drop line, by sensing low-band noise. The tap-off controlling unit 460 also checks, for each tap port, whether or not the tap port is being used, and sends information about the checked result.

When the predetermined period of time set by the operator has elapsed, the subscriber tap-off control module 110 of the main control PC 100 reads out information about each subscriber tap-off 400 stored in the control result database 120, and generates a test signal for the subscriber tap-off 400, based on the read-out information (Step S110). At this time, when the operator desires to randomly generate a test signal, this can be achieved by operating the subscriber tap-off control module 110. Of course, the present invention is limited to such an operation.

The main control PC 100 sends the test signal to the RF modem 200 which, in turn, modulates the test signal. The modulated test signal from the RF modem 200 is then transmitted to the subscriber tap-off 400 via the network 300.

The signal splitting unit 410 of the subscriber tap-off 400 splits the test signal in order to distribute the test signal to the filtering unit 420 and signal detecting unit 470. The filtering unit 420 filters the received test signal, and sends the resultant signal to the data detecting unit 440. The data detecting unit 440 detects data contained in the signal applied thereto, and transmits the detected data.

The CPU of the tap-off control unit 460 detects the address of the test signal applied thereto (Step S120), and checks, based on the detected address, whether or not the test signal is associated with a desired address (Step S130). When it is determined that the test signal is associated with a desired address, the address of the test signal is identified in order to receive the test signal (Step S140).

The CPU of the tap-off control unit 460 requests the signal detecting

unit 470 to send information about all tap ports, for example, 8 tap ports in the illustrated case, in order to read out the information (Step S150).

The signal detecting unit 470 determines whether or not the voltages distributed to the resistors R3 and R4 vary, and transmits the determined result to the CPU of the tap-off control unit 460. The CPU of the tap-off control unit 460 determines, for each drop line, whether or not a problem associated with line break or short circuit occurs at the drop line, based on the result of the voltage variation determination sent from the signal detecting unit 470 (Step 160).

The CPU of the tap-off control unit 460 receives check signals from respective ICs, that is, IC1 to IC8, and transmits information about the 8 tap ports to the modulating unit 430, based on the received check signals. The modulating unit 430 performs a frequency modulation for the information received from the CPU of the tap-off control unit 460, and transmits the modulated signal to the main control PC 100 via the filtering unit 420 (Step S170).

Where it is determined at the address test signal checking step S130 that the test signal is associated with a desired address, the tap-off control unit 460 passes the received test signal (Step S180).

The subscriber tap-off control module 110 of the main control PC 100 receives the signal from the subscriber tap-off 400 demodulated by the RF modem 200 to detect tap information (Step S190). Based on the detected tap information, the subscriber tap-off control module 110 checks, for each tap port, whether or not the tap port is in a normal state (step S200). In accordance with the checked result, the operator selects whether the tap port is to be switched on or off (Step S210). In this case, the operator manually switches on or off the tap port. This switching manipulation can be carried out for respective tap ports. Alternatively, all tap ports may be switched on or off simultaneously.

The subscriber tap-off control module 110 has an auto function for switching on each tap port when its drop line is normally used, an automatic recovery function for automatically switching off each tap port when line break or short circuit is generated at its drop line, and automatically switching on the switched-off tap port after a recovery of the drop line, and a forced ON/OFF function for controlling the switching ON/OFF operations for all tap

ports individually or simultaneously.

The forced ON/OFF function is carried out in response to a control command from the main control PC 100. This forced ON/OFF function has a priority over the tap auto function. The switching from the forced ON/OFF mode to the tap auto mode is achieved only when the subscriber tap-off control module 120 of the main control PC 100 performs a reset operation. The tap port or ports automatically opened due to line break or short circuit may be switched on again in accordance with a control command from the subscriber tap-off control module 120. Of course, in the forced OFF state, the associated tap port cannot be automatically switched on even when its drop line is recovered to its normal state. In order to return the control mode of the subscriber tap-off control module 110 to the tap auto mode, it is necessary to reset the associated tap port or tap ports, individually. If a configuration simultaneously resetting all tap ports is adopted, then there may be a problem in that it automatically recovers even the tap or taps forcedly switched off due to a certain problem associated therewith, for example, failure to pay service charges.

The subscriber tap-off control module 110 checks whether or not a tap port ON/OFF control is selected by the operator (Step S220). Where the operator selects the tap port ON/OFF control, the subscriber tap-off control module 110 generates a tap port ON/OFF control signal (Step S230), and sends the generated signal to the subscriber tap-off 400.

Based on the tap port ON/OFF control signal, the CPU of the tap-off control unit 460 checks the transmission address of the control signal (Step S240), while checking whether or not the control signal is a priority release request signal (Step S250).

Where the control signal is the priority release request signal, the CPU of the tap-off control unit 460 automatically resets the associated IC of the signal detecting unit 470 via its tap port ON/OFF control terminal (Step S260).

Where the control signal is not the priority release request signal, but an ON/OFF signal for individual or all tap ports (Step S270), the CUP switches on or off the tap ports individually or simultaneously.

After completion of the automatic resetting step S260, the associated IC sends information about its 8 tap ports to the CPU of the tap-off control

unit 460 (Step S280). The CPU sends control result information collected from all ICs to the subscriber tap-off control module 110 of the main control PC 100 (Step S290).

The subscriber tap-off control module 110 receives the control result information (Step S300), and stores it in the control result database 120 (Step S310).

Although the preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Industrial Applicability

As apparent from the above description, the subscriber tap-off capable of monitoring respective states of transmission lines at subscriber ends, and the remote control system and method using the subscriber tap-off can achieve an enhancement in communication quality meeting the demands of subscribers.

In accordance with the present invention, there are technical advantages. That is, it is possible to control subscriber connection and disconnection operations in a bidirectional communication fashion, to easily identify an unauthorized user, and to rapidly identify the position of a drop line connected to a subscriber terminal where a problem such as line break, short circuit or noise occurs. In particular, the generation of line break and short circuit is checked using a voltage drop method.

Also, there are economical advantages. That is, it is possible to reduce the labor cost in that the number of business trips to check failure is reduced, to reduce debts caused by subscribers who are in arrears, and to easily identify unauthorized users.

Moreover, it is possible to maintain the network in an optimum quality state.

In addition, the consumers can receive network services of a high quality in accordance with rapid after-services. They can also receive network signals only at a desired time.

Claims

1. A subscriber tap-off for supplying a data communication signal to a user terminal via an associated one of tap ports, the subscriber tap-off operating in accordance with a tap port control signal from a main control terminal via a network, comprising:

a signal detecting unit for detecting whether or not line break or short circuit is generated at a drop line connected between the user terminal and the tap port, thereby monitoring the drop line; and

a tap-off controlling unit for receiving information about the detected result from the signal detecting unit, and switching on or off the tap port, based on the received information.

2. The subscriber tap-off according to claim 1, further comprising:

a noise detecting unit for detecting a noise signal generated at the drop line, whereby the tap-off controlling unit receives information about the detected noise signal from the noise detecting unit, and controls the tap port switching-on/off operation, based on the received information.

3. The subscriber tap-off according to claim 1, further comprising:

a signal splitting unit for splitting the data communication signal transmitted via the network and the tap port control signal from the main control terminal, thereby distributing the split signals to the signal detecting unit and the tap-off controlling unit;

a filtering unit for filtering the split signals from the signal splitting unit;

a data detecting unit for detecting data contained in the filtered signal from the filtering unit, and transmitting the detected data to the tap-off controlling unit; and

a modulating unit for receiving, from the tap-off controlling unit, tap information to be sent to the main control terminal, and modulating the received tap information.

4. The subscriber tap-off according to claim 1, wherein the signal detecting unit comprises:

a voltage supply module for supplying a power supply voltage;

a detecting module including a pair of series-connected resistors respectively connected to the tap-off controlling unit and the drop line, the detecting module serving to detect variations in respective voltages applied to the resistors, thereby detecting whether or not generation of line break, short circuit, or unauthorized use occurs; and

an integrated circuit module for transmitting the detected voltage variations from the detecting module to the tap-off controlling unit, and switching on or off signals to be applied to the tap port in accordance with the tap port control signal from the main control terminal.

5. A remote control system for controlling a user terminal connected thereto via a network by transmitting a control signal to the user terminal in a remote fashion, comprising:

a subscriber tap-off for detecting at least one of communication line problems associated with a line break or short circuit generated at a drop line connected to the user terminal, and noise generated at the drop line, thereby switching on and off a tap port connected to the drop line; and

a main control terminal for at least one function for switching on and off a connected state of the tap port, and transmitting a tap port ON/OFF signal to the subscriber tap-off,

whereby the drop line is monitored.

6. The remote control system according to claim 5, wherein the subscriber tap-off comprises:

a signal detecting unit for detecting whether or not line break or short circuit is generated at the drop line connected to the user terminal;

a noise detecting unit for detecting a noise signal generated at the drop line; and

a tap-off controlling unit for receiving information about the detected result from the signal detecting unit, and information about the detected result from the noise detecting unit, thereby switching on or off the tap port.

7. The remote control system according to claim 6, wherein the subscriber tap-off further comprises:

a signal splitting unit for splitting the data communication signal transmitted via the network and the tap port control signal from the main control terminal, thereby distributing the split signals to the signal detecting unit and the tap-off controlling unit;

a filtering unit for filtering the split signals from the signal splitting unit;

a data detecting unit for detecting data contained in the filtered signal from the filtering unit, and transmitting the detected data to the tap-off controlling unit; and

a modulating unit for receiving, from the tap-off controlling unit, tap information to be sent to the main control terminal, and modulating the received tap information.

8. The remote control system according to claim 6, wherein the signal detecting unit comprises:

a voltage supply module for supplying a power supply voltage;

a detecting module including a pair of series-connected resistors respectively connected to the tap-off controlling unit and the drop line, the detecting module serving to detect variations in respective voltages applied to the resistors, thereby detecting whether or not generation of line break, short circuit, or unauthorized use occurs; and

an integrated circuit module for transmitting the detected voltage variations from the detecting module to the tap-off controlling unit, and switching on or off signals to be applied to the tap port in accordance with the tap port control signal from the main control terminal.

9. The remote control system according to claim 5, wherein the main control terminal comprises an interface which is an application program for executing the control function.

10. The remote control system according to any one of claims 5 to 9, wherein the control function comprises:

a tap auto function for switching on the tap port only when the drop line is normally used;

an automatic recovery function for automatically switching off the tap

port when line break or short circuit is generated at its drop line, and automatically switching on the switched-off tap port after a recovery of the drop line; and

a forced ON/OFF function for controlling the switching ON/OFF operations for the tap port independently of or simultaneously with other tap ports included in the subscriber tap-off.

11. A remote control method carried out using a remote control system for controlling a user terminal connected thereto via a network by transmitting a control signal to the user terminal in a remote fashion, comprising the steps of:

controlling a subscriber tap-off included in the remote control system to sense at least one of communication line problems associated with a line break or short circuit generated at a communication line connected to the user terminal, and noise generated at the communication line; and

controlling a main control terminal included in the remote control system to generate a signal for controlling the subscriber tap-off, thereby controlling a tap port ON/OFF operation of the subscriber tap-off in accordance with at least one control function,

whereby the communication line is monitored.

12. The remote control method according to claim 11, wherein the sensing step comprises the steps of:

disconnecting the tap port from the communication line when line break or short circuit is generated at the communication line, and sending a line break or short circuit message to the main control terminal; and

sending a noise generation message to the main control terminal when a noise signal is generated at the communication line.

13. The remote control method according to claim 11, wherein the controlling step comprises the steps of:

if the main control terminal transmits a subscriber tap-off test control signal, then identifying a transmission address of the test control signal;

transmitting information about a tap port state to the main control terminal, after the identification of the transmission address;

generating a desired control signal from the main control terminal associated with the control function, based on the information, and transmitting the control signal to the subscriber tap-off; and

performing the tap port ON/OFF operation of the subscriber tap-off in accordance with the control signal associated with the control function.

14. The remote control method according to claim 13, wherein the tap port ON/OFF operation performing step comprises the steps of:

controlling the subscriber tap-off to sense whether or not the control signal is a priority release request signal, and to perform an automatic resetting operation when the control signal is the priority release request signal;

controlling the subscriber tap-off to perform the tap port ON/OFF operation for the tap port independently of or simultaneously with other tap ports included in the subscriber tap-off when the control signal is not the priority release request signal; and

transmitting, to the main control terminal, the control results obtained at the steps of controlling the subscriber tap-off.

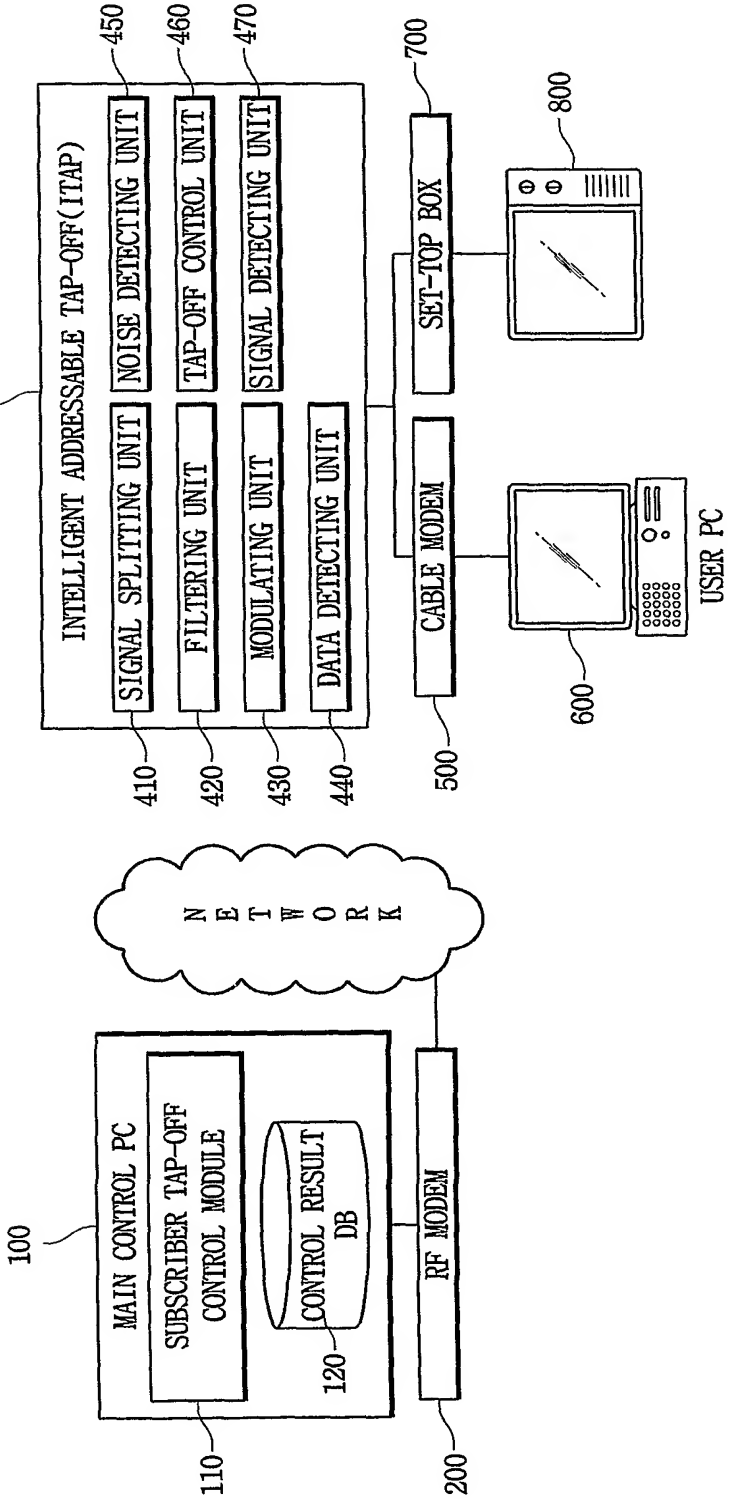
15. The remote control method according to any one of claims 11 to 13, wherein the control function comprises:

a tap auto function for switching on the tap port only when the communication line is normally used;

an automatic recovery function for automatically switching off the tap port when line break or short circuit is generated at its communication line, and automatically switching on the switched-off tap port after a recovery of the communication line; and

a forced ON/OFF function for controlling the switching ON/OFF operations for the tap port independently of or simultaneously with other tap ports included in the subscriber tap-off.

FIG.1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CONTROL RESULT DB
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110
RF MODEM
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NETWORK
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SIGNAL SPLITTING UNIT
FILTERING UNIT
MODULATING UNIT
DATA DETECTING UNIT
NOISE DETECTING UNIT
TAP-OFF CONTROL UNIT
SIGNAL DETECTING UNIT
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CABLE MODEM
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SET-TOP BOX
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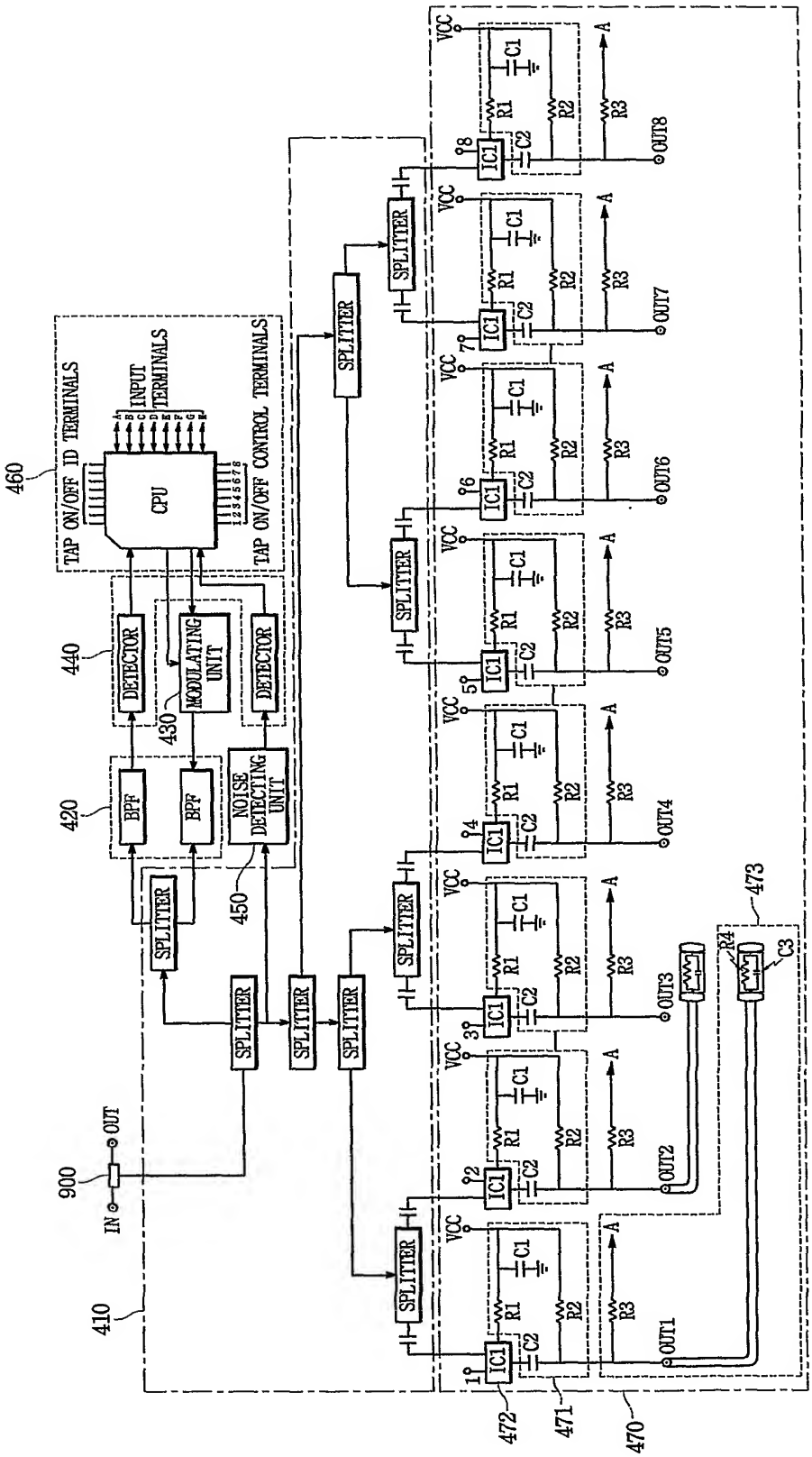
800
600
USER PC

FIG.2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DETECTOR
MODULATING UNIT
DETECTOR
430
420
BPF
BPF
NOISE DETECTING UNIT
450
SPLITTER
410
900
OUT
IN
VCC
IC1
C1
C2
R1
R2
R3
A
OUT1
OUT2
OUT3
OUT4
OUT5
OUT6
OUT7
OUT8
R4
C3
473
472
471
470

FIG.3a

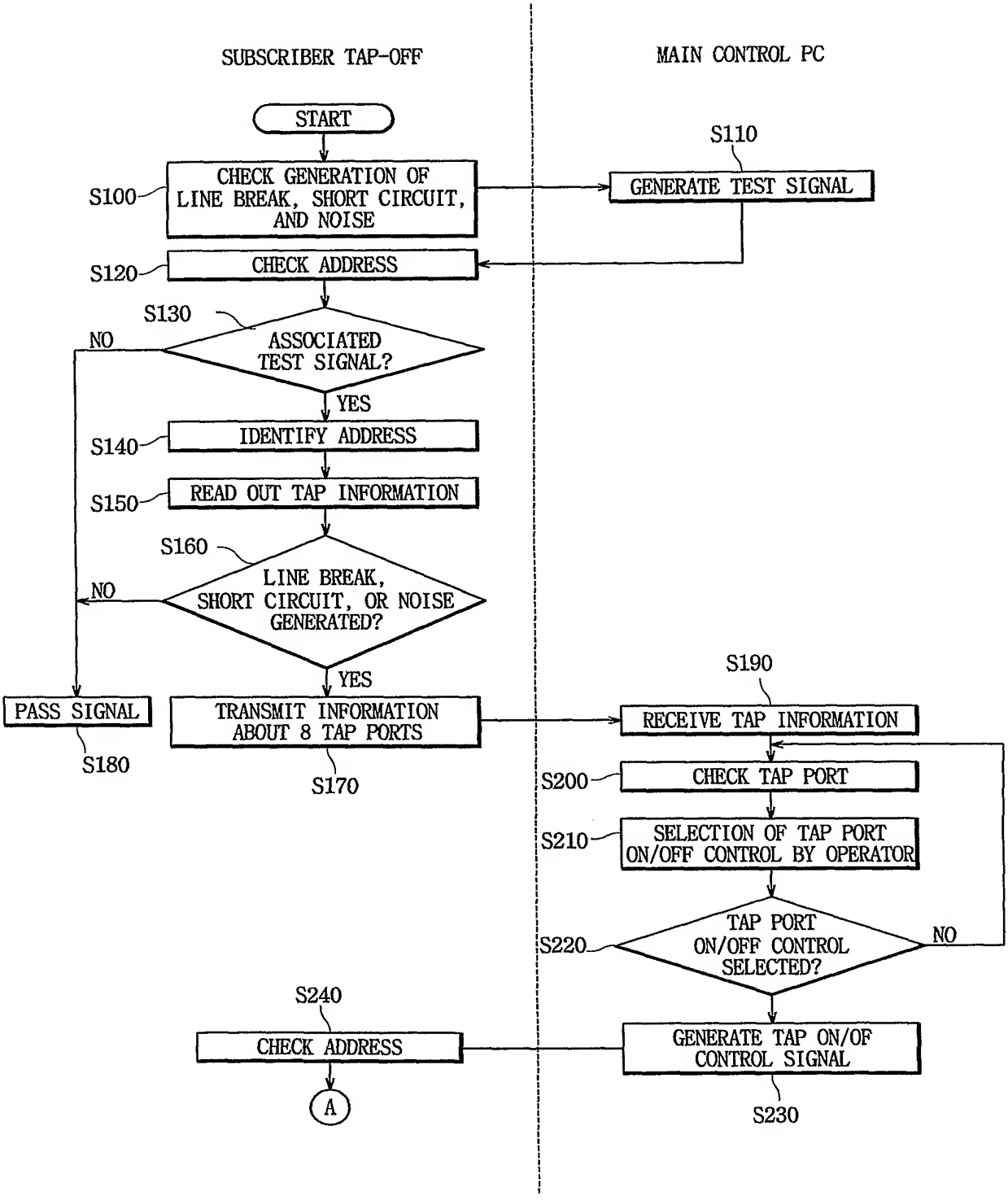
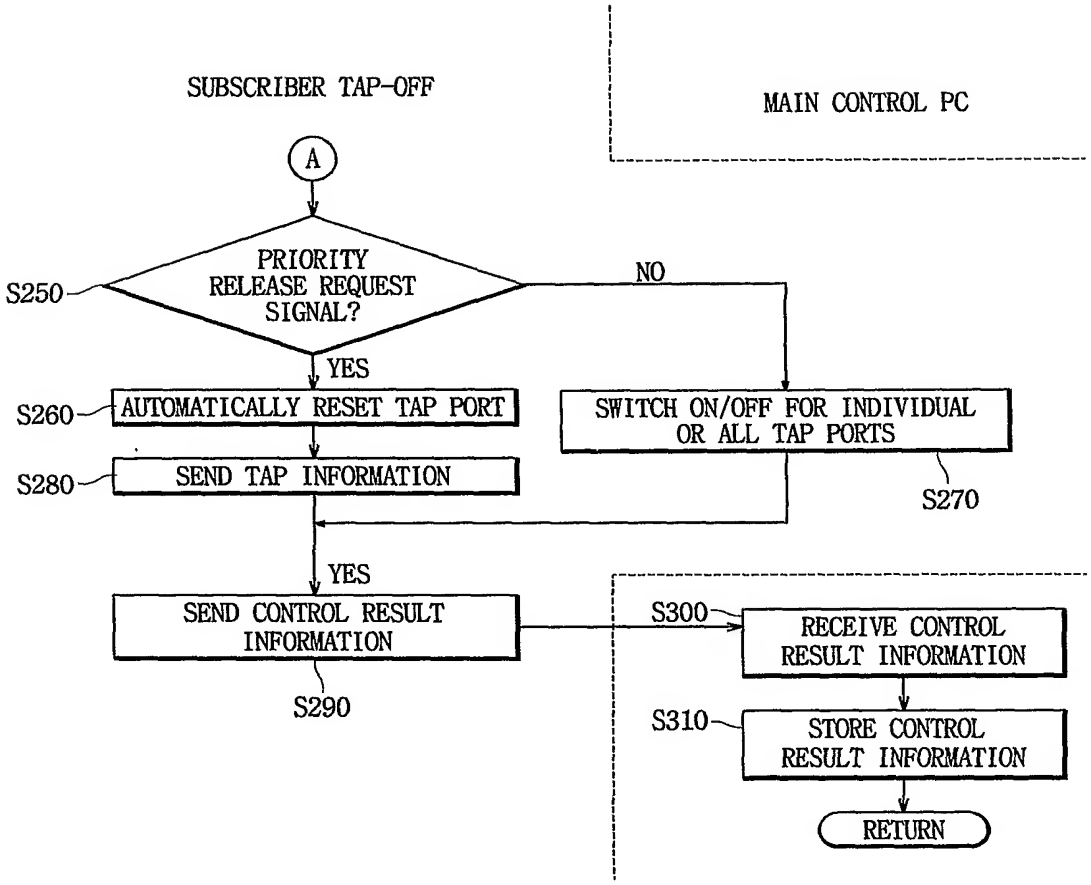

SUBSCRIBER TAP-OFF
MAIN CONTROL PC
START
S100
CHECK GENERATION OF LINE BREAK, SHORT CIRCUIT, AND NOISE
S110
GENERATE TEST SIGNAL
S120
CHECK ADDRESS
S130
ASSOCIATED TEST SIGNAL?
NO
YES
S140
IDENTIFY ADDRESS
S150
READ OUT TAP INFORMATION
S160
LINE BREAK, SHORT CIRCUIT, OR NOISE GENERATED?
NO
YES
PASS SIGNAL
S180
TRANSMIT INFORMATION ABOUT 8 TAP PORTS
S170
S190
RECEIVE TAP INFORMATION
S200
CHECK TAP PORT
S210
SELECTION OF TAP PORT ON/OFF CONTROL BY OPERATOR
S220
TAP PORT ON/OFF CONTROL SELECTED?
NO
S240
CHECK ADDRESS
A
GENERATE TAP ON/OF CONTROL SIGNAL
S230

FIG.3b


SUBSCRIBER TAP-OFF
MAIN CONTROL PC
A
PRIORITY RELEASE REQUEST SIGNAL?
S250
NO
YES
S260
AUTOMATICALLY RESET TAP PORT
SWITCH ON/OFF FOR INDIVIDUAL OR ALL TAP PORTS
S280
SEND TAP INFORMATION
S270
YES
SEND CONTROL RESULT INFORMATION
S290
S300
RECEIVE CONTROL RESULT INFORMATION
S310
STORE CONTROL RESULT INFORMATION
RETURN

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR02/00852

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 H04L 12/26 H04B 3/46 H04M 3/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 H04L 12/26 H04B 3/46 H04M 3/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KOREAN PATENTS AND APPLICATIONS FOR INVENTIONS SINCE 1975
KOREAN UTILITY MODELS AND APPLICATIONS FOR UTILITY MODELS SINCE 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 08-298481 A (OMRON CORP.) 12 NOVEMBER 1996	1, 5, 11
A	JP 11- 168527 A (NEC ENG LTD.) 22 JUNE 1999	1, 5, 11
A	US 5,615,225 A (HARRIS CORP.) 25 MARCH 1997	1, 5, 11
A	KR 1999-0046159 A (PARK RAE UNG) 5 JULY 1999	1, 5, 11

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevence
"E" earlier application or patent but published on or after the international filing date
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"Y" document of particular relevence; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 AUGUST 2002 (27.08.2002)	27 AUGUST 2002 (27.08.2002)

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